

WHAT IS CLAIMED IS:

1. A system for controlling a plurality of different bioreactor processes in a plurality of bioreactors, comprising:

a first communication network;

a second communication network;

a first bioreactor configured to send a first data signal related to a condition in said first bioreactor;

a second bioreactor configured to send a second data signal related to a condition in said second bioreactor;

a utility tower, coupled to said first and second bioreactors, configured to receive the first and second data signals and send first information based on the first data signal and second information based on the second data signal over said first network, and configured to receive a first control signal for said first bioreactor and a second control signal for said second bioreactor over said second network and change a condition in said first bioreactor based on the first control signal and change a condition in said second bioreactor based on the second control signal; and

a controller, connected to said utility tower by said first and second network, configured to receive the information from said utility tower over said first network, determine the first control signal based on a first bioreactor process and/or the first information, and determine the second control signal based on the second bioreactor process and/or the second information, and send the first and second control signals to said utility tower over said second network.

2. The system of Claim 1, further comprising:

a third communication network;

a computer configured to accept input of a control command to change a desired condition in a desired connected bioreactor and send a command signal indicating the control command to said controller over said third network; and

wherein said controller is connected to said computer via said third communication network and is further configured to receive the command signal from said computer,

determine a third control signal based on the command signal and send the third control signal to said utility tower over said second network, and wherein said utility tower is further configured to receive said third control signal and to change the desired condition in the desired connected bioreactor based on the third control signal.

3. A system for controlling a bioreactor process, comprising:
  - a communication system;
  - a controller configured to receive information related to a condition in a bioreactor, to control the bioreactor process by determining control signals based on the bioreactor process, and to send the control signals over said communication system; and
  - a utility tower, coupled to said controller via said communication system, configured to receive the control signals and to change a condition in the bioreactor based on the control signals, said utility tower comprising
    - a monitoring system that transmits information related to a condition of the bioreactor to said controller via said communication system,
    - a bioreactor supply system which supplies a substance to the bioreactor in response to a control signal, and
    - an agitation system which agitates the solution in the bioreactor in response to a control signal.

4. The system of Claim 3, wherein said controller is further configured to determine control signals using the received information related to a condition in the bioreactor.

5. The system of Claim 4, wherein said utility tower further comprises a temperature control system which changes the temperature of media in the bioreactor in response to a control signal,

6. The system of Claim 3, wherein said bioreactor supply system comprises a gas control system that provides a gas to the bioreactor, and a pump control system that provides a fluid to the bioreactor.

7. The system of Claim 4, wherein said monitoring system comprises transmitters for sending information related to conditions in said bioreactor to said controller.

8. The system of Claim 7, wherein said transmitters comprise:

a temperature transmitter for sending information related to a temperature condition of the bioreactor to said controller;

a pH transmitter for sending information related to a pH condition of the bioreactor to said controller; and

a dissolved oxygen transmitter for sending information related to a dissolved oxygen condition of the bioreactor to said controller.

9. The system of Claim 4, wherein said utility tower further comprises a computer configured to receive information from a user and send the user information to said controller, over said communication system and wherein said controller receives the user information and determines a control signal based on the user information.

10. The system of Claim 9, further comprising an input device to enter the user information into said computer.

11. The system of Claim 9, further comprising an agitation unit connected to said utility tower, wherein said agitation unit provides agitation to said bioreactor based on the agitation control signal received from said agitation system.

12. The system of Claim 9, wherein said communication system comprises a first communication network, a second communication network, and a third communication network

13. The system of Claim 4, wherein said communication system comprises a first communication network over which the monitoring system transmits information related to a condition of the bioreactor to said controller.

14. The system of Claim 13, wherein said communication system further comprises a second communication network over which said bioreactor supply system and said agitation system communicate with said controller.

15. The system of Claim 14, wherein said utility tower further comprises a computer configured to receive information from a user and send the user information to said controller, and wherein said communication system further comprises a third communication network over which said computer and said controller communicate.

16. The system of Claim 4, further comprising:

a second utility tower, coupled to said controller via said communication system, configured to receive a second control signal and provide support to a second bioreactor based on the second control signal, comprising

a monitoring system that transmits information related to a condition of the second bioreactor to said controller via said communication system,

a bioreactor supply system which provides a substance to the second bioreactor based on the second control signal, and

an agitation system which sends an agitation control signal to the second bioreactor based on the second control signal; and

wherein said controller is configured to receive information related to a condition in the second bioreactor, determine the second control signal based on a second desired bioreactor process and the received information and send the second control signal over said communication system to said second utility tower.

17. The system of Claim 15, wherein said first communication network comprises a FOUNDATION™ fieldbus, said second communication network comprises a DeviceNet bus, and said third communication network comprises an Ethernet bus.

18. The system of Claim 6, wherein the temperature control system comprises a cold finger.

19. The system of Claim 6, wherein the temperature control system comprises a double-walled vessel system.

20. The system of Claim 6, wherein the temperature control system comprises a heating blanket.

21. The system of Claim 9, wherein the computer comprises a display screen, and wherein said system is configured to show a graphical representation of said system on said display screen.

22. The system of Claim 21, wherein said display screen comprises a touch-screen.

23. The system of Claim 4, wherein the bioreactor process is cell culture growth.

24. The system of Claim 4, wherein the bioreactor process is microbial fermentation.

25. A method of controlling a benchtop bioreactor with a controller configured with a sequence of steps and parameters of a bioreactor process and coupled to a bioreactor utility tower via a communication system, comprising:

determining a control action to change a condition in the bioreactor based on the sequence of steps of the bioreactor process;

sending a first signal from the controller to the bioreactor utility tower over the communication system to direct the bioreactor utility tower to perform a first control action; and

performing the first control action to change the condition in the bioreactor.

26. The method of Claim 25 further comprising:

receiving a measurement signal indicating a condition in the benchtop bioreactor at the bioreactor utility tower;

transmitting information related to the condition to the controller over the communication system;

comparing the transmitted information to a parameter of the bioreactor process to determine a second control action;

sending a second signal from the controller to the bioreactor utility tower via the communication system to control the bioreactor utility tower to perform the second control action; and

performing the second control action to change the condition in the bioreactor.

27. The method of Claim 26, wherein transmitting comprises transmitting the information related to a condition over a first communication network of the communication system.

28. The method of Claim 25, wherein sending comprises sending the first signal over a second communication network of the communication system.

29. The method of Claim 28, further comprising:

entering control information for changing a user selected bioreactor condition into a computer;

sending the control information from the computer to the process controller via a third communication network of the communication system;

analyzing the control information on the process controller to determine a third control action for changing the user selected condition in the bioreactor;

sending a third signal from the process controller to the bioreactor utility tower via the second communication network to direct the bioreactor utility tower to perform the third control action; and

performing the third control action to change the user selected condition in the bioreactor.

30. The method of Claim 27, wherein the bioreactor process is cell culture growth.

31. The method of Claim 27, wherein the bioreactor process is microbial fermentation.

32. The method of Claim 25, wherein the first control action comprises providing a substance to the bioreactor.

33. The method of Claim 25, wherein the first control action comprises removing a substance from the bioreactor.

34. The method of Claim 25, wherein the first control action comprises providing agitation to the bioreactor.

35. A system for controlling a bioreactor process, comprising:  
means for determining a control action to change a condition in the bioreactor based on the sequence of steps of the bioreactor process;

means for sending a first signal from the controller to the bioreactor utility tower over the communication system to direct the bioreactor utility tower to perform a first control action; and

means for performing the first control action to change the condition in the bioreactor.

36. The system of Claim 35, further comprising:  
means for receiving a measurement signal indicating a condition in the benchtop bioreactor at the bioreactor utility tower;

means for transmitting information related to the condition to the controller over the communication system;

means for comparing the transmitted information to a parameter of the bioreactor process to determine a second control action;

means for sending a second signal from the controller to the bioreactor utility tower via the communication system to control the bioreactor utility tower to perform the second control action; and

means for performing the second control action to change the condition in the bioreactor.

37. The system of Claim 36, further comprising:

means for entering control information for changing a user selected bioreactor condition into a computer;

means for sending the control information from the computer to the process controller via a third communication network of the communication system;

means for analyzing the control information on the process controller to determine a third control action for changing the user selected condition in the bioreactor;

means for sending a third signal from the process controller to the bioreactor utility tower via the second communication network to direct the bioreactor utility tower to perform the third control action; and

means for performing the third control action to change the user selected condition in the bioreactor.

38. A system for monitoring and controlling a process in a controlled chamber, the process comprising a sequence of steps and at least one parameter relating to a condition of the process, comprising:

a communication system;

a controller configured to receive information related to a condition in the chamber, to control the chamber process by determining a control action required to carry out the process based on the chamber process steps and the received information, to generate a control signal corresponding to the control action, and to send the control signal over said communication system; and

a utility tower, coupled to said controller via said communication system, configured to provide information related to a condition in the chamber to said controller via said communication system, to receive the control signal from said controller and to change a condition of the chamber based on the control signal, said utility tower comprising

a monitoring system that transmits information related to a condition of the chamber to said controller via said communication system,

a temperature control system which changes the temperature of the chamber in response to a control signal, and

a chamber supply system which supplies a substance to the bioreactor in response to the control signal.

39. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method of controlling a benchtop bioreactor with a controller configured with a sequence of steps and parameters of a bioreactor process and coupled to a bioreactor utility tower via a communication system, the method comprising:

receiving a measurement signal indicating a condition in the benchtop bioreactor at the bioreactor utility tower;

transmitting information related to the condition from the utility tower to the controller over the communication system;

comparing the information to a parameter of the bioreactor process to determine a control action;

sending a signal from the controller to the bioreactor utility tower via the communication system to control the bioreactor utility tower to perform the control action; and

performing the control action to change the condition in the bioreactor.